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In an investigation of the nutritive properties of commercial oleos and their ingredients, the writer and coworkers<sup>3</sup> have found a considerable difference in their vitamine content. It is significant that of the oleo oils those most highly pigmented were also the richest in fat-soluble vitamine and those least pigmented were the poorest. This, in view of the present prevailing conception of the importance of the vitamine content of certain fats in the diet, is a matter of such great economic significance that comment on it is reserved until the investigations now in progress shall have been completed. It is mentioned here merely to indicate why it is considered possible that the fat-soluble vitamine may be one of the yellow pigments or a closely related compound.

In scores of feeding experiments in which butter fat as prepared from ordinary butter has been used as the source of the fat-soluble vitamine we have repeatedly observed variations in the vitamine content. It has not been possible to correlate this with the degree of pigmentation—which is well known to vary with the feed and the breed of the dairy cow—as the amount of natural pigment present had been concealed by the addition of butter color. One fact however appears particularly significant, and that is, that when butter fat is heated its vitamine is destroyed and simultaneously there occurs a destruction of its pigment.<sup>3</sup> Whether this is an accidental coincidence or one and the same thing remains to be seen.

From the evidence submitted it appears reasonably safe, at least as a working hypothesis, to assume that the fat-soluble vitamine is a yellow plant pigment or a closely related compound, which view, moreover, is strengthened by the fact that we know through the work of Palmer and Eckles<sup>4</sup> of the inability of the animal to synthesize the yellow pigments carotin and xanthophyll. From its occurrence in butter, in leaves, in carrots and in other materials known to be rich in carotin,

<sup>3</sup> H. Steenbock, P. W. Boutwell and Hazel E. Kent, *Jour. Biol. Chem.*, 35, 517, 1918.

<sup>4</sup> L. S. Palmer and C. H. Eckles, *Jour. Biol. Chem.*, 17, 211, 223, 237, 245, 1914.

it might be concluded that we were here concerned with carotin. Some data, that we have accumulated have answered this in the negative and it has been so reported,<sup>5</sup> but it appears doubtful if much importance can be attached to these earlier results as we have since observed that carotin under certain conditions is a very labile compound. We do not desire to mislead our readers by indicating that we have conclusive evidence one way or another.

Provisionally, we are assuming that the fat-soluble vitamine is one of the yellow plant pigments, but we are not unmindful of the possibility that the reasons for the association of these properties in nature, viz., yellow pigmentation and this growth-promoting property may be a genetic one in some cases, while in others it may be indicative of mere similarity in physical if not chemical properties. If it is not a pigment, no doubt, instances will soon be found where it is found to occur liberally in non-pigmented materials. We already have indications that certain materials are as rich in the fat-soluble vitamine as is yellow corn, yet they are far less pigmented. Whether this can be explained in difference of kind of pigment which in yellow corn is known to be principally xanthophyll or whether we are dealing in these instances with the leuco compound remains to be seen.

It is scarcely necessary to elaborate on these findings or to point out their possible economic significance. Many investigations based on the general premises which we have here outlined are now in progress and will be reported as the evidence obtained seems to warrant a detailed discussion.

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#### THE AMERICAN MATHEMATICAL SOCIETY

THE twenty-sixth summer meeting of the society was held at the University of Michigan, September 2-4, in conjunction with meetings of the Mathematical Association of America and the

<sup>5</sup> H. Steenbock, P. W. Boutwell and Hazel E. Kent, *Proc. Amer. Soc. Biol. Chem.*, 1919.

American Astronomical Society. On Thursday afternoon there was a joint session, at which the following papers were presented:

"Mathematics and statistics," retiring address of the president of the Mathematical Association of America, by E. V. HUNTINGTON.

"The work of the National Research Council with reference to mathematics and astronomy," by E. W. BROWN.

Reports on the international conference of scientists at Brussels, by FRANK SCHLESINGER and L. A. BAUER.

The following papers were presented to the society:

*On wind corrections:* PETER FIELD.

*Cauchy's memoir of 1814 on definite integrals:* H. J. ETTLINGER.

*Expansion of any determinant in minors from rectangular panels:* L. H. RICE.

*Pseudo-canonical forms and invariants of systems of partial differential equations:* A. L. NELSON.

*On the separation of complex roots of an algebraic equation:* A. J. KEMPNER.

*Some theorems on the zeros of solutions of homogeneous linear differential equations of the  $n$ th order:* C. N. REYNOLDS, JR.

*Some theorems on the zeros of solutions of self-adjoint homogeneous linear differential equations of the fifth order:* C. N. REYNOLDS, JR.

*Proof of the existence of distinct three-dimensional manifolds with the same group:* J. W. ALEXANDER.

*Certain determinants expressible as circulants or skew-circulants:* E. D. ROE, JR.

*A brief account of the life and work of the late Professor Ulisse Dini:* W. B. FORD.

*The resolvents of König and other types of symmetric functions:* S. P. SHUGERT.

*Form of the number of subgroups of prime-power groups:* G. A. MILLER.

*A generalization of a formula of Schubert in enumerative geometry:* E. S. ALLEN.

*Joint axis congruences with indeterminate developables:* E. P. LANE.

*A modification of an integral test for the convergence and divergence of infinite series:* R. W. BRINK.

*Certain types of involutorial space transformations (second paper):* F. R. SHARPE and VIRGIL SNYDER.

*Transformations of surfaces applicable to a quadric:* L. P. EISENHART.

*Transformations of cyclic systems of circles:* L. P. EISENHART.

*Differential equations containing arbitrary functions:* G. A. BLISS.

*Functions of lines in ballistics:* G. A. BLISS.

*On the relative positions of the complex roots of an algebraic equation with real coefficients and those of its derived equation:* D. R. CURTISS.

*Urn schemata as a basis for the development of the theory of correlation:* H. L. RIETZ.

*Projective transformations in function space (second paper):* L. L. DINES.

*On the invariants belonging to a hypernumber in an algebra of infinite order:* J. B. SHAW.

*Conditions necessary and sufficient for the existence of a Stieltjes integral:* R. D. CARMICHAEL.

*Note on convergence tests for series and on Stieltjes integration by parts:* R. D. CARMICHAEL.

*Note on a physical interpretation of Stieltjes integrals:* R. D. CARMICHAEL.

*An apparent anomaly in errors of interpolated values:* H. A. HOWE.

*Transformations of a Stieltjes integral potential:* G. C. EVANS.

*Note on sequences of Stieltjes integrals:* T. H. HILDEBRANDT.

*Differential equations of motion of a projectile regarded as a particle:* W. H. ROEVER.

*Certain properties of binomial coefficients:* W. D. CAIRNS.

*On the shape of polynomial curves:* A. J. KEMPNER.  
Abstracts of these papers and a fuller report of the meeting will be published in the November number of the *Bulletin of the American Mathematical Society*.

E. J. MOULTON,  
Acting Secretary

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